Classful and Classless IP Addresses

1. Find the number of addresses in a range if the first address is 146.102.29.0 and the last address is 146.102.32.255.
2. The first address in a range of addresses is 14.11.45.96. If the number of addresses in the range is 32, what is the last address?
3. An address in a block is given as 73.22.17.25. Find the number of addresses in the block, the first address, and the last address.
4. An address in a block is given as 180.8.17.9. Find the number of addresses in the block, the first address, and the last address.
5. An address in a block is given as 200.11.8.45. Find the number of addresses in the block, the first address, and the last address.
6. In a block of addresses, we know the IP address of one host is 25.34.12.56/16. What is the first address (network address) and the last address (limited broadcast address) in this block?
7. In a block of addresses, we know the IP address of one host is 182.44.82.16/26. What is the first address (network address) and the last address (limited broadcast address) in this block?
8. The following addresses are defined using slash notations. Find the network mask, prefix length and the suffix length.
   a. 12.23.24.78/8
   b. 130.11.232.156/16
   c. 167.199.170.82/27
9. One of the addresses in a block is 167.199.170.82/27. Find the number of addresses in the network, the first address, and the last address.
10. One of the addresses in a block is 17.63.110.114/24. Find the number of addresses, the first address, and the last address in the block.
11. One of the addresses in a block is 110.23.120.14/20. Find the number of addresses, the first address, and the last address in the block.
12. An organization is granted the block 130.34.12.64/26. The organization needs four subnetworks, each with an equal number of hosts. Design the subnetworks and find the information about each network.
13. An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets as shown below:
    ❑ One subblock of 120 addresses.
    ❑ One subblock of 60 addresses.
    ❑ One subblock of 10 addresses.
    Design the subnetworks and find the information about each network.
14. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.
    a. Find the subnet mask.
    b. Find the number of addresses in each subnet.
    c. Find the first and the last address in the first subnet.
    d. Find the first and the last address in the last subnet (subnet 500).
15. An organization is granted the block 130.56.0.0/16. The administrator wants to create 1024 subnets.
    a. Find the subnet mask.
    b. Find the number of addresses in each subnet.
    c. Find the first and the last address in the first subnet.
    d. Find the first and the last address in the last subnet (subnet 1024).
16. An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 subnets.
    a. Find the subnet mask.

b. Find the number of addresses in each subnet.
c. Find the first and the last address in the first subnet.
d. Find the first and the last address in the last subnet (subnet 32).

17. Assume a company has three offices: Central, East, and West. The Central office is connected to the East and West offices via private, WAN lines. The company is granted a block of 64 addresses with the beginning address 70.12.100.128/26. The management has decided to allocate 32 addresses for the Central office and divides the rest of addresses between the two other offices. Design the subnetworks and find the information about each network.
18. An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:
    a. The first group has 64 customers; each needs approximately 256 addresses.
    b. The second group has 128 customers; each needs approximately 128 addresses.
    c. The third group has 128 customers; each needs approximately 64 addresses.

    Design the subblocks and find out how many addresses are still available after these allocations.
19. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows:
    a. The first group has 200 medium-size businesses; each needs approximately 128 addresses.
    b. The second group has 400 small businesses; each needs approximately 16 addresses.
    c. The third group has 2000 households; each needs 4 addresses.

    Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.
20. An ISP is granted a block of addresses starting with 120.60.4.0/20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 8 addresses only. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

IPv4 Header

1. The value of HLEN in an IP datagram is 7. How many option bytes are present?
2. The size of the option field of an IP datagram is 20 bytes. What is the value of HLEN? What is the value in binary?
3. The value of the total length field in an IP datagram is 36 and the value of the header length field is 5. How many bytes of data is the packet carrying?
4. An IP datagram has arrived with the following information in the header (in hexadecimal):
   45 00 00 54 00 03 00 00 20 06 00 00 7C 4E 03 02 B4 0E 0F 02
    a. Is the packet corrupted?
    b. Are there any options?
    c. Is the packet fragmented?
    d. What is the size of the data?
    e. Is a checksum used?
    f. How many more routers can the packet travel to?
    g. What is the identification number of the packet?
    h. What is the type of service?

UDP Header

1. The following is a dump of a UDP header in hexadecimal format.
   00 45 DF 00 00 58 FE 20
    a. What is the source port number?
    b. What is the destination port number?
    c. What is the total length of the user datagram?

d. What is the length of the data?
e. Is the packet directed from a client to a server or vice versa?
f. What is the client process?

2. The following is a DUMP of a UDP header in hexadecimal format.
   06 32 00 0D 00 1C E2 17
   a. What is source port number?
   b. What is destination port number?
   c. What is length of user datagram?
   d. What is length of the data?
   e. Is the packet directed from a client to server or vice versa?
   f. What is the client process?
3. The following is a dump of a UDP header in hexadecimal format.
   CB 84 00 0D 00 1C 00 1C
   a. What is the source port number?
   b. What is the destination port number?
   c. What is the total length of the user datagram?
   d. What is the length of the data?

TCP Header

1. If the value of HLEN is 0111, how many bytes of option are included in the segment?
2. The following is a dump of a TCP header in hexadecimal format.
   (05320017 00000001 00000000 500207FF 00000000)$_{16}$
   a. What is the source port number?
   b. What is the destination port number?
   c. What the sequence number?
   d. What is the acknowledgment number?
   e. What is the length of the header?
   f. What is the type of the segment?
   g. What is the window size?
3. The following is a dump of a TCP header in hexadecimal format:
   04010015 0000028A 0000012C 500207D0 00000000
   a. What is the source port number?
   b. What is the destination port number?
   c. What is the sequence number?
   d. What is the acknowledgment number?
   e. What is the length of the header?
   f. What is the type of the segment?
   g. What is the window size?
4. The following is a dump of a TCP header in hexadecimal format:
   00CD0018 00000EF1 00000D5D 502200D1 01BF0010
   a. What is the source port number?
   b. What is the destination port number?
   c. What is the sequence number?
   d. What is the acknowledgement number?
   e. What is the length of the header?
   f. Which control bits are set and what do they represent?
   g. What is the window size?